

CLAIMS

1. Cutting device, comprising:

two sets of internally coupled blades, said blades cooperating in a cutting action by relative motion therebetween, said blades including:

- a) a set of inner blades in at least partial spiral shape, wherein each of said inner blades has at least one cutting edge, and
- b) a set of outer blades in at least partial spiral shape, wherein each of said outer blades has at least one cutting edge.

2. Device of claim 1 wherein said cutting actions are selected from the group including shearing, slicing, and sawing.

3. Device of claim 1 wherein said inner blades are spiral, wherein static formations of said inner blades obtain from geometrical properties of a class of shapes including spiral, spring or auger.

4. Device of claim 1 wherein said inner blades have working edges, wherein said blades are spiral and are dynamically formed via rotation and oscillation therebetween at said working edges.

5. Device of claim 4 wherein said working edges form blades or fans.

6. Device of claim 1 wherein said spiral shape of said outer blades is for part or whole spiral/spring shape, comber shape, hybrid shape of comber and spring, or the composite shape of a series of q-shaped units.
7. Device of claim 1 wherein said relative motion is for rotation, oscillation along the axes, rotational oscillation around the axes, or combination of these motions, to create cutting actions such as shearing, sawing, or a combination of shearing and sawing.
8. Device of claim 1 wherein said cutting edges of said blades may be continuous or discontinuous, and may be segmented, smooth, unsmooth and even serrated.
9. Device of claim 1 wherein said cutting blades slippage-stopping mechanisms.
10. Device of claim 1 further comprising a lawn mower, hedge trimmer, hair clipper, cutting or grinding unit, or cutting/mixing unit.
11. Device of claim 1 further comprising means for cutting and/or mulching objects, such as leaves, twigs, grass-like plants, fibers, hairs, and the like.
12. Device of claim 1 wherein said outer blades are part of an outer blade subassembly and may have an end-ring affixed at each end.

13. Device of claim 1 wherein said inner blades is part of an inner blade subassembly and may have an end-disc affixed at each end, wherein each of said end-discs may have a polygon hole in the center.

14. Device of claim 13 wherein said inner blade subassembly may further include one driven shaft, wherein said driven shaft may have a polygon cross-sectional shape for coupling with the polygon hole of said end-discs.

15. Device of claim 13 wherein said inner blade subassembly may further include one or more blowing fans mounted on said driven shaft, said blowing fans may have cutting edges along with their fan-blades for mulching cuttings generated by cutting actions of said inner and outer blades.

16. Device of claim 13, further comprising: a frame subassembly having end-plates wherein said inner blade subassembly and said outer blade subassembly are captured between a first and a second said end-plates, and at least one linking bar for linking said end-plates and stabilizing said device.

17. Device of claim 13 further including at least one mulching blade on at least one of said end-discs of said inner blade subassembly and on said end-plates of said frame subassembly, wherein said mulching blades provide said device with an integrated function of mulching cuttings generated by the cutting actions of said blades.

18. Device of claim 1 further defining a working unit from the group of systems including lawn mowers, hedge trimmers, hair clippers, cutting and grinding units in grinders, or cutting and mixing units in mixers.

19. Method for cutting, mulching and expelling cuttings, including the steps of:
- A) providing two sets of internally coupled blades, with at least one set of blades being static or dynamically formed whole spiral shape,
 - B) enabling the blades to having relative motions therebetween and permitting rotation, oscillation along the axes, rotational oscillation around the axes, or combinations of these motions, to create cutting actions such as shearing, sawing, or a combination of shearing and sawing, with an integrated function of mulching the cuttings generated by the cutting actions,
 - C) cutting objects thereby, such as leaves, twigs, grass-like plants, fibers, hairs, and the like by action of said sets of blades while mulching the cuttings generated by said cutting action,
 - D) expelling cuttings via spiral/auger shaped blades cooperating with other means, such as blowing fans and fan units,
 - E) erecting and raking in objects to be cut by said blades using self-cleaning rotary comber,
 - F) having slippage-stopping mechanisms built into said blades to prevent objects being cut from escaping the cutting edges of said blades,
 - G) using bevel-gear transmission to drive said blades to simulate the cutting unit of rotary type mowers.
 - H) using epicyclic-gear train to drive said blades to simulate the cutting unit of reel type mowers.

20. A cutting device, comprising:

at least two internally coupled blades, of which at least one blade is whole spiral-shaped while the other is at least partial spiral shaped, and the blades having relative rotation therebetween for achieving a cutting action.